

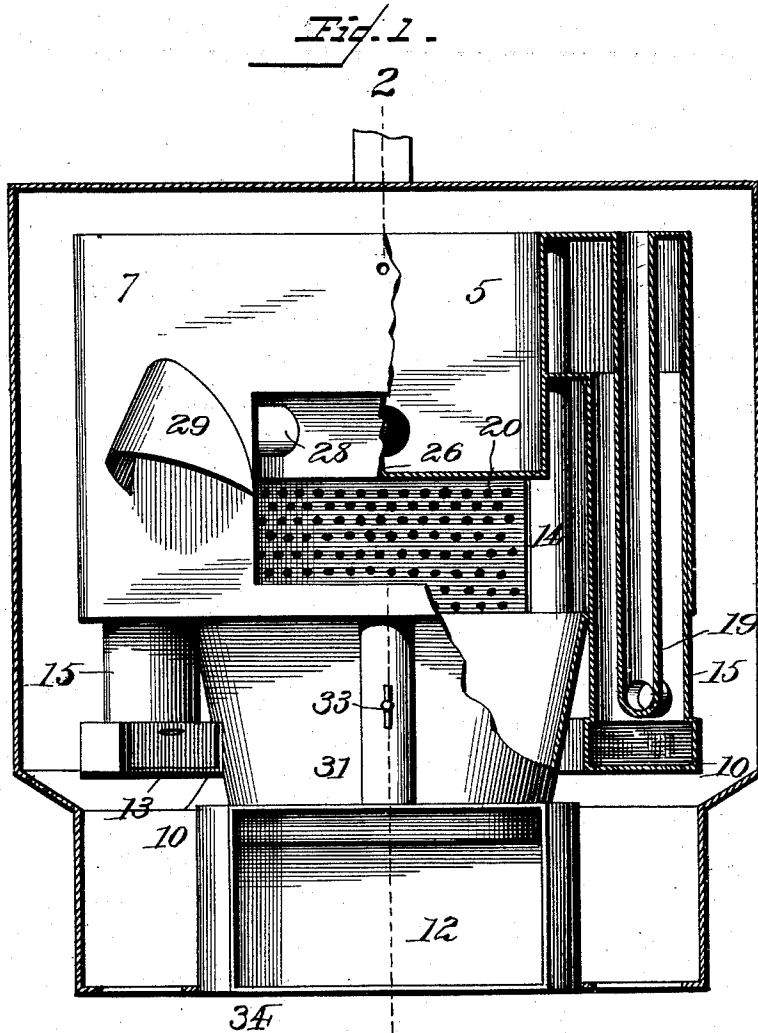
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3 Sheets—Sheet 1.

J. CUNNINGHAM.
HOT AIR FURNACE.

No. 477,519.

Patented June 21, 1892.



Witnesses
Alfred T. Gage.

Inventor
James Cunningham
By *H. H. Henderson*
Att'y.

(No Model.)

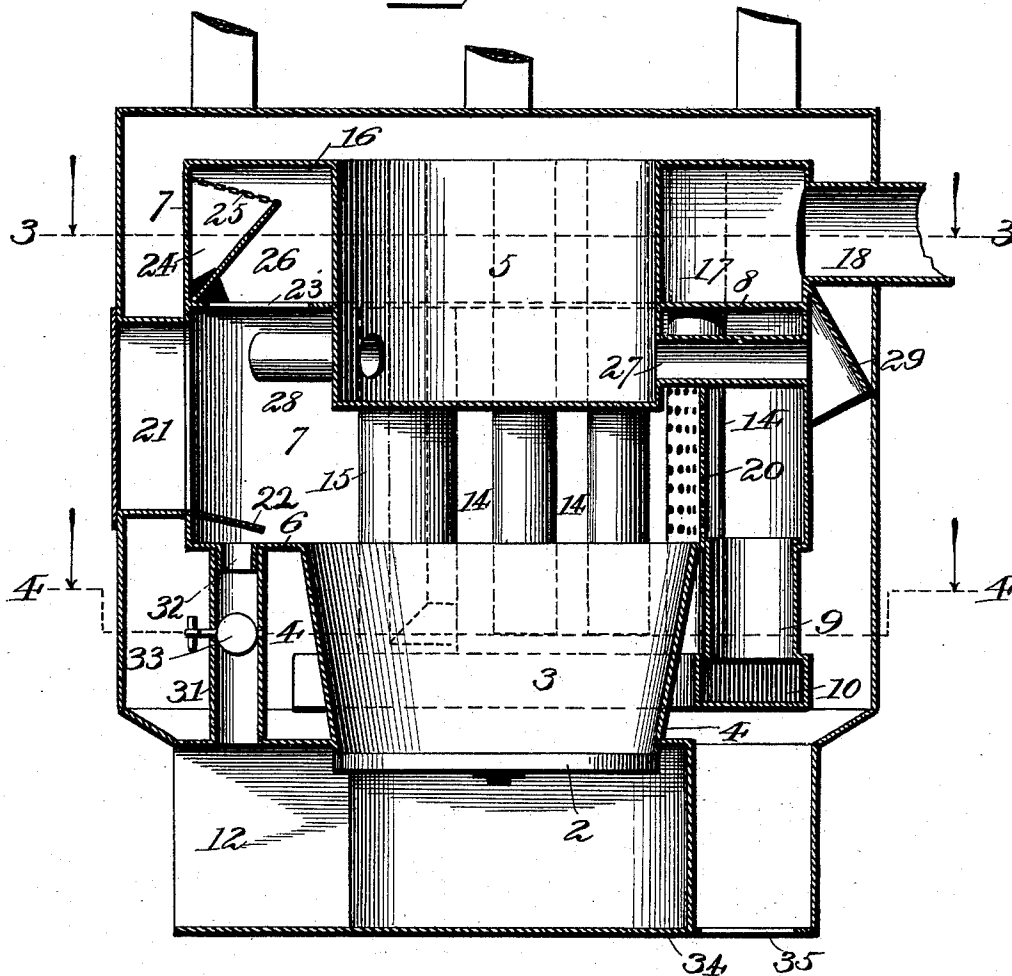
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Fig. 2.



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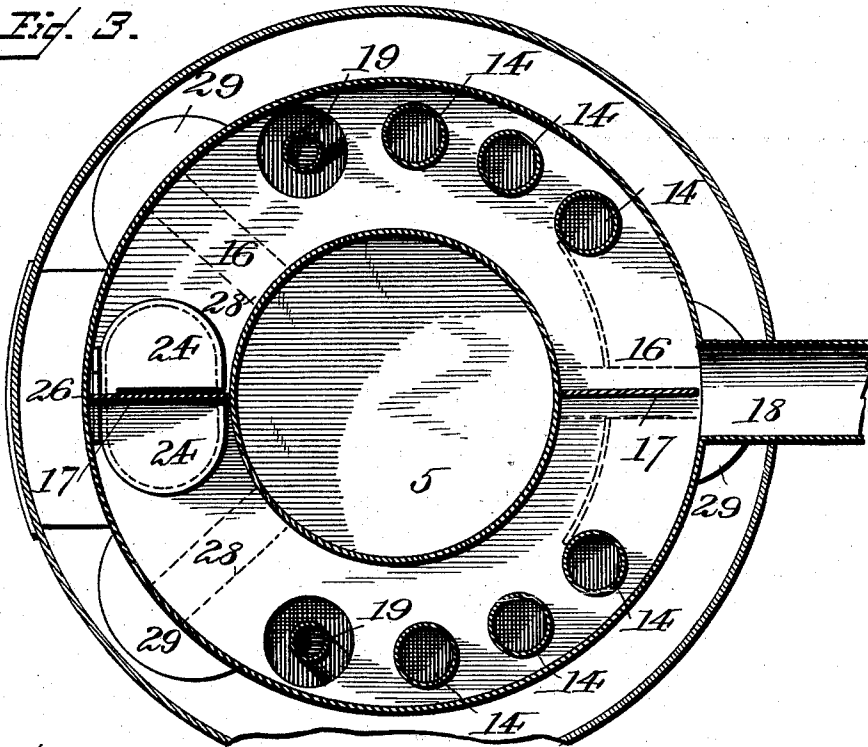
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J. CUNNINGHAM.
HOT AIR FURNACE.

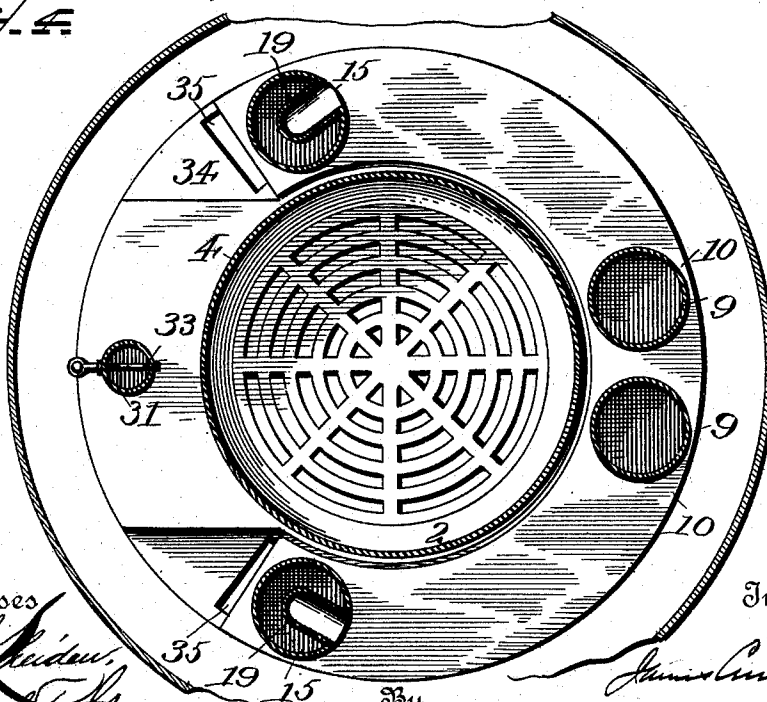
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Fig. 3.



~~File 4~~



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UNITED STATES PATENT OFFICE.

JAMES CUNNINGHAM, OF DUSHORE, PENNSYLVANIA.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 477,519, dated June 21, 1892.

Application filed January 9, 1892. Serial No. 417,556. (No model.)

To all whom it may concern:

Be it known that I, JAMES CUNNINGHAM, a citizen of the United States, residing at Dushore, in the county of Sullivan and State of Pennsylvania, have invented certain new and useful Improvements in Hot-Air Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to heaters or furnaces of the type used for the interior heating of dwellings and inhabitable buildings.

It is the purpose of my invention to provide an apparatus for these uses having an improved direct and return draft and provided with means whereby the temperature and draft may be easily, quickly, and accurately regulated.

It is my further purpose to provide the maximum heating area for the air-chambers and to utilize to the utmost degree possible all the fuel consumed.

My invention consists to these ends in the several novel features of construction and new combinations of parts hereinafter fully set forth, and then more particularly pointed out and defined in the claims following this specification.

To enable others skilled in the art to understand and to make, construct, and use my invention, I will proceed to describe the same in detail, reference being had for such purpose to the accompanying drawings, in which—

Figure 1 is a central vertical section, half in elevation, showing my invention. Fig. 2 is a section taken upon the line 2 2, Fig. 1. Fig. 3 is a transverse section taken in the horizontal line 3 3, Fig. 2. Fig. 4 is a transverse section in the line 4 4, Fig. 2.

In the said drawings the reference-numeral 1 denotes the case of the heater, or that portion thereof inclosed within the outer casing. This part of the structure may be of any suitable form, being merely subjacent to the grate 2 and fire-pot 3 and serving as an ash-box to prevent the passage of dust and ashes to the hot-air flues.

The fire-box 3 is inclosed by a substantially circular wall 4, the diameter thereof increasing somewhat with the extension of said wall upward to pack the coal slightly as it descends to the grate. Above the fire-box and substantially concentric with it is a hanging air-drum 5, having a closed bottom which lies above the plane of the upper edge of the wall 4 of the fire-box, as shown in Fig. 2, thus leaving a continuous open space for the passage of the products of combustion. From the upper edge of the wall 4 a wall 6 extends horizontally outward, forming an annular bottom to a draft-space which runs around the whole structure, being inclosed by a vertical circular wall 7, which rises to the open top of the drum 5. At a point between its top and the closed lower end of the drum 5 is introduced a horizontal partition 8, extending from the wall 7 to the vertical wall of the drum. The space inclosed beneath this horizontal wall and the parallel wall 6 is a draft-circulation chamber having direct communication with the fire-box on all sides.

Opening through the bottom wall 6, upon each side of a diametrical line drawn from front to rear, is a pipe 9 of suitably large diameter, its lower end being dropped, usually, to a point somewhat above the plane of the grate, where it enters the top of a curved or partly-circular draft-chamber 10, extending around the rear of the heater, its two ends terminating at or near each side of the extension 12, which opens from the ash-box toward the front of the heater. These ends are closed, usually, by doors or caps 13, which give access to the interior to enable it to be cleansed of dust and other accumulating foreign matter. Between these ends and the draft-pipes 9 are arranged a series of vertical pipes 14, which terminate at their lower ends a short distance above the top of the curved draft-chamber 10 and open at their upper ends through the top of the draft-chambers 16, so that air may enter the lower ends of said pipes and discharge into the hot-air space above the draft-chambers 16. At or near each end of said draft-chambers is a pipe 15, which opens through the top wall only, and is therefore in communication with the interior of the draft-chamber 10. These pipes extend up to and pass through the horizontal

partition-wall 8, opening into draft-chambers 16, (shown in Fig. 3,) which are closed between the wall of the drum 5 and the wall 7. Each of these draft-chambers is divided from the other by a vertical fore-and-aft partition 17, extending between the inner and the outer curved walls, and directly behind the rear edge of this partition opens the draft-flue 18, which leads to the chimney, the flue opening in the wall 7 lying about equally upon each side of the dividing-partition. Concentric with the pipes 15 are interior smaller pipes 19, the lower ends of which may traverse the draft-chamber 10 and open through its bottom, or else turn laterally and open through the sides of the pipes 15, as indicated by dotted lines in Fig. 2 of the drawings. The upper extremities of said pipes in like manner extend through the upper curved draft-chambers 16 and open through the top thereof, as shown in Fig. 1. The air-pipes 14 extend upward and pass through the draft-chambers 16, their extremities opening through the top walls of said chambers. I have shown three of these pipes on each side, besides the pipes 9, 15, and 19; but it is evident that the number may be varied, as well as the relative diameter.

In order to prevent coal and ashes or other matter from being accidentally thrown into the pipes 9, and thus accumulating in the draft-chambers 10, I usually place a perforated screen 20 or foraminous wire diaphragm along the rear part of the fire-box between the base of the drum 5 and the horizontal wall 6. Through the front portion of the wall 7, diametrically opposite the draft-flue 18, is the door-opening 21, having a passage-screen 22 extending in toward the fire-box. Just above the inner extremity of this passage a draft-opening 23 is formed in the partition 8, a damper 24 being provided by which said opening may be closed or opened either wholly or in part by means of a chain 25 or its equivalent passing through an opening in the circular wall 7.

Between the wall 8 and the circular wall of the drum 5 extends a vertically fore-and-aft partition 26, (shown in Fig. 3,) by which the inclosed space above the partition 8, which constitutes the two draft-chambers 16, is divided into two substantially equal parts. The damper 24 is provided with a slot in which this partition lies, the functions of the latter being to divide the products of combustion rising from the fire-box into two volumes and compel the two currents to flow on opposite sides around the drum 5 and reunite in flue 18.

Entering the curved vertical wall 7, directly beneath the dividing-partition 17, is a horizontal or nearly-horizontal pipe 27, which passes radially and inward and penetrates the vertical wall of the drum 5 at a point a little above its base. I have shown in Figs. 2 and 3 two additional pipes 28 of similar form and arrangement, one upon each side of

the door. Over the outer ends of the pipes are placed screens or hoods 29, which aid in gathering the air as it rises and directing it into the receiving ends of the pipes 27 and 28, and aiding, also, in driving it through the latter into the interior of the drum, which is entered by these air-currents from widely-different directions and near the bottom of the drum 5 is directly exposed to the hottest gases of combustion.

Rising from the top of the passage 12, which leads to the fire-box, is a small draft-regulating pipe 31, the upper end of which receives a nipple-joint 32, dropping from the horizontal wall 6. The pipe is provided with a damper 33, by which air may be admitted to the draft-space just above the top of the circular wall of the fire-box. This air may be used to diminish the force of the draft or to aid in the more complete ignition and consumption of the products of combustion.

It will readily be seen that by throwing open the damper 24 the entire draft may be allowed to pass through the draft-chamber 16, or by adjusting said damper it may be divided between the upper and the lower draft-chambers 16 and 10, or driven wholly through the latter through the drop-pipes 9, thence up through the pipes 15, around the exterior of the pipes 19, thence through the draft-chambers 16, and out through the flue.

The outside casing of the heater is usually placed just outside the hoods 29 and contracted at its lower portion to unite with the dampered base-plate 34, which is provided with openings 35 to receive air from the air-box. These parts require no special description, being of substantially the well-known construction.

Having described my invention and set forth its merits, what I claim is—

1. In a heater or air-furnace, the combination, with a fire-box having a horizontal wall extending outward from its top and forming, in conjunction with a vertical and an upper horizontal wall, a draft-space surrounding the top of the fire-box, of a curved draft-chamber extending nearly around the outside of the fire-box, draft-pipes connecting the said chamber with curved draft-chambers above, the bottom of said upper draft-chambers being the top of the draft-space surrounding the top of the fire-box, and drop-pipes opening from space in rear of the top of the fire-box into the top of the lower curved draft-chamber, substantially as and for the purposes set forth.

2. In a heater or furnace, the combination, with an upper and a lower curved draft-chamber connected at the front of the heater by vertical draft-pipes, of a draft-space extending entirely around the open top of the fire-box, and drop-pipes giving communication between said space and the lower draft-chamber, air-pipes traversing said upper chamber, and the draft-space between it and the lower curved draft-chamber, and a damper regu-

lating a draft-opening in the bottom of the upper draft-chamber, the bottom of which chamber forms the top of said draft-space, by which direct communication between the draft-space and said upper draft-chamber may be established and cut off, substantially as and for the purposes set forth.

3. In a heater or furnace, the combination, with a fire-box and with a draft-space surrounding the top thereof, of two partly-circular draft-chambers, one above and one below, air-pipes traversing the upper chamber and the draft-space between it and the lower draft-chamber, draft-pipes connecting the rear portion of the lower draft-chamber with the draft-space around the top of the fire-box, vertical pipes connecting said draft-chambers, a drum surrounded by and dropping below the upper draft-chamber, its closed bottom hanging above the fire-space, and radial pipes giving communication with said drum and the exterior, their outer ends having hoods or screens, and the inner ends opening above the bottom of the drum, substantially as and for the purposes set forth.

4. In a furnace, the combination, with the fire-chamber and with a circular draft-space surrounding and lying above the upper end of the fire-chamber, of a draft-chamber partly surrounding and lying wholly outside the fire-chamber and below the draft-space, with which it is connected near its middle portion by drop-pipes, draft-pipes connecting the ends of said draft-chamber with semicircular draft-chambers above, concentric air-pipes traversing the draft-pipes and upper draft-chamber, a flue into which the upper semicircular chambers discharge, a draft-damper closing an opening by which the circular draft-space communicates with the semicircular draft-chambers above, an air-drum closed at the

bottom and open above, surrounded by and dropping below the semicircular draft-chambers, and radial pipes traversing the circular draft-space and communicating with the interior of the air-drum near its base and with the exterior hot-air space, substantially as and for the purposes set forth.

5. In a furnace or heater, the combination, with a draft-space communicating directly with the fire-chamber, of an air-drum hanging partly within said space and having its closed bottom and lower portion directly over the fire-chamber, semicircular draft-spaces surrounding the upper portion of said drum and provided with dampered openings communicating with the draft-space below, a flue opposite the dampered openings into which said semicircular spaces discharge, radial air-pipes traversing the draft-passage around the drum and entering the drum near its closed bottom, their outer ends being covered by hoods having a downward inclination and expansion or flare, substantially as and for the purposes set forth.

6. In a furnace or heater, the combination, with an air-drum having its closed lower portion hanging over the fire-chamber and surrounded by a circular draft-space traversed by air-heating pipes, of radial air-heating pipes connecting the interior of said drum with the exterior hot-air space, the exterior ends of said pipes being overhung by hoods opening downward and converging toward the pipe-entrance, substantially as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES CUNNINGHAM.

Witnesses:

RUSH J. THOMSON,
F. V. THOMSON.